

C L A I M S

1. A simulation apparatus for a communication system, for carrying out tests for protocol messages in communication with a communication terminal to be evaluated by transmitting test signals to the communication terminal to be evaluated, and receiving response signals from the communication terminal to be evaluated, comprising:

a definition file in which a convention including a definition regulated with respect to a configuration of nodes which are information elements of protocol messages in communication with the communication terminal to be evaluated has been described;

an interface library including an application program interface which can provide and receive operational information with respect to the nodes of the protocol messages to and from an exterior section;

a memory managing section which manages various data relating to the nodes of the protocol messages;

a decode processing section which specifies a data region and a value of data allocated to each node in the protocol messages by processing to decode the protocol messages along the definition regulated in the definition file and in accordance with the operational information from the exterior section to the interface library, and which delivers data of each node corresponding to the protocol messages to

the memory managing section; and

an encode processing section which generates a desired protocol message by combining the data relating to the nodes of the protocol messages managed at the memory managing section, along the definition regulated in the definition file and in accordance with the operational information from the exterior section to the interface library.

2. A simulation apparatus for a communication system according to claim 1, characterized in that

the decode processing section processes to decode the protocol messages input via the interface library, prepares a message tree showing a relationship of a hierarchy of each node of the protocol messages based on the definition regulated in the definition file and outputs the message tree to the memory managing section, and detects data of an arbitrary node denoted by a path which has been designated from among the data relating to the nodes of the protocol messages managed at the memory managing section based on a path denoting a node at which there is desired data, which is designated via the interface library.

3. A simulation apparatus for a communication system according to claim 1, characterized by further comprising:

a scenario executing section which stores an executable format scenario in which a sequence

for executing transmission in a desired protocol message to the communication terminal to be evaluated and reception in the desired protocol message from the communication terminal to be evaluated has
5 been described, and which outputs at least a receive protocol message received from the communication terminal to be evaluated to the interface library by executing the executable format scenario in accordance with the sequence described in the executable format
10 scenario;

a trace data managing section which manages the sequence of the desired protocol message executed at the scenario executing section; and

a first display control section which carries
15 out control for causing to display the sequence of the desired protocol message managed at the trace data managing section onto a display section.

4. A simulation apparatus for a communication system according to claim 3, characterized in that
20 the decode processing section processes to decode the protocol messages input via the interface library, prepares a message tree showing a relationship of a hierarchy of each node of the protocol messages based on the definition regulated in the definition file
25 and outputs the message tree to the memory managing section, and detects data of an arbitrary node denoted by a path designated from among the data relating

to the nodes of the protocol messages managed at the memory managing section based on a path denoting a node at which there is desired data, which is designated via the interface library.

5 5. A simulation apparatus for a communication system according to claim 1, characterized by further comprising:

an encode and decode editing section which has a user interface to receive an editing operation in each
10 section of node of a desired protocol message via the interface library, and which edits the desired protocol message;

a second display control section which carries out control for causing to display onto the display section
15 contents of the editing operation in each section of node of the desired protocol message received by the user interface of the encode and decode editing section; and

a descriptive format scenario storage section
20 which stores a descriptive format scenario described as a sequence for transmitting and receiving the desired protocol message edited at the encode and decode editing section.

25 6. A simulation apparatus for a communication system according to claim 5, characterized in that

the decode processing section processes to decode the desired protocol message, prepares a message tree

showing a relationship of a hierarchy of each node of the desired protocol message based on the definition regulated in the definition file, causes to display the message tree onto the display section via the
5 second display control section, and outputs it to the memory managing section to thereby detect data of an arbitrary node denoted by a path designated from among the data relating to the nodes of the desired protocol message managed at the memory managing section based on
10 a path denoting a node at which there is desired data, which is designated via the interface library.

7. A simulation apparatus for a communication system according to claim 3, characterized in that
the scenario executing section has an executable
15 format scenario storage section which translates a descriptive format scenario in which a sequence for executing transmission in a desired protocol message to the communication terminal to be evaluated and reception in the desired protocol message from
20 the communication terminal to be evaluated has been described, into an executable format scenario, and which stores a translated scenario, and the scenario executing section executes the sequence for transmitting and receiving in the desired protocol
25 message with respect to the communication terminal to be evaluated based on the executable format scenario stored in the executable format scenario storage

section.

8. A simulation apparatus for a communication system according to claim 4, characterized in that

the scenario executing section acquires a
5 reception path denoting a desired node from the message tree of the desired receive protocol message which has been prepared by the decode processing section, and which relates to reception from the communication terminal to be evaluated, acquires a value of data
10 of an arbitrary node denoted by the reception path designated from among the data relating to the nodes of the receive protocol message managed at the memory managing section based on the reception path, reads an expected value which has been stored in the scenario
15 executing section or the memory managing section in advance, and which becomes an origin to be contrasted for determination, and comparatively determines an acquired value of the data of the node and a read expected value.

20 9. A simulation apparatus for a communication system according to claim 8, characterized in that

the first display control section causes to
display the value of the data of the node acquired
by the scenario executing section and the expected
25 value read by the scenario executing section so as to correspond to each other onto the display section, and displays a comparatively determined result by

the scenario executing section so as to be identified as being normal or abnormal.

10. A simulation apparatus for a communication system according to claim 6, characterized in that

5 the encode and decode editing section

acquires a reception path denoting a desired node from the message tree of the desired receive protocol message which has been prepared by the decode processing section in advance, and which relates
10 to reception from the communication terminal to be evaluated, and acquires a value of data of a node of the desired receive protocol message selected based on the reception path, and

acquires a transmission path denoting a node
15 corresponding to the selected node of the desired receive protocol message from the message tree of the desired transmit protocol message which has been prepared by the decode processing section in advance, and which relates to transmission to the communication
20 terminal to be evaluated, and inserts a value of data of the selected node of the desired receive protocol message as a value of data of a node of the desired transmit protocol message selected based on the transmission path.

25 11. A simulation apparatus for a communication system according to claim 4, characterized in that

the decode processing section selects a desired

first node from an evaluation message tree prepared from evaluation protocol messages to be evaluated, and detects a second node which is a path same as a path of the desired first node selected from the evaluation message tree, from a reference message tree prepared from reference protocol messages for being compared with the evaluation protocol messages to be evaluated, and

the first display control section causes to display the first node selected from the evaluation message tree and a reference message tree including the second node detected from the reference message tree so as to be comparable onto the display section.

12. A simulation apparatus for a communication system according to claim 11, characterized in that in accordance with an opening/closing operation for a child tree from one message tree of the evaluation message tree and the reference message tree, opening/closing of another child tree which is same as the child tree is carried out.

13. A simulation apparatus for a communication system according to claim 11, characterized in that the evaluation protocol message is a receive protocol message which becomes an object to be evaluated from the communication terminal to be evaluated, and the reference protocol message is a receive protocol message for reference in

communication by a terminal of a same type as that of the communication terminal to be evaluated.

14. A simulation method for a communication system, for carrying out tests for protocol messages in communication with a communication terminal to be evaluated by transmitting test signals to the communication terminal to be evaluated, and receiving response signals from the communication terminal to be evaluated, the method comprising:

10 a step of preparing a definition file in which a convention including a definition regulated with respect to a configuration of nodes which are information elements of the protocol messages in communication with the communication terminal to be evaluated has been described;

15 a step of preparing an interface library including an application program interface which provides and receives operational information with respect to the nodes of the protocol messages to and from an exterior section;

20 a step of preparing a memory managing section which manages various data relating to the nodes of the protocol messages;

25 a step of processing to decode the protocol messages along the definition regulated in the definition file and in accordance with the operational information from the exterior section to the interface

library to thereby specify a data region and a value of data allocated to each node in the protocol messages, and delivering data of each node corresponding to the protocol messages to the memory managing section;
5 and

a step of generating a desired protocol message by combining the data relating to the nodes of the protocol messages managed at the memory managing section, along the definition regulated in the
10 definition file and in accordance with the operational information from the exterior section to the interface library.

15 15. A simulation method for a communication system according to claim 14, characterized in that the step of processing to decode the protocol messages has:

a step of processing to decode protocol messages input via the interface library, preparing a message tree showing a relationship of a hierarchy of each
20 node of the protocol messages based on the definition regulated in the definition file, and outputting the message tree to the memory managing section; and

a step of detecting data of an arbitrary node denoted by a path designated from among the data
25 relating to the nodes of the protocol messages managed at the memory managing section denotes based on a path denoting a node at which there is desired data, which

is designated via the interface library.

16. A simulation method for a communication system according to claim 14, characterized by further comprising:

5 a step of storing an executable format scenario in which a sequence for executing transmission in a desired protocol message to the communication terminal to be evaluated and reception in the desired protocol message from the communication terminal to be evaluated
10 has been described;

 a step of enabling to output at least a receive protocol message received from the communication terminal to be evaluated to the interface library, by executing the executable format scenario in accordance
15 with the sequence described in the executable format scenario;

 a step of preparing a trace data managing section which manages the sequence of the desired protocol message executed in the step of executing the scenario;
20 and

 a step of carrying out a first display control for causing to display the sequence of the desired protocol message managed at the trace data managing section onto a display section.

25 17. A simulation method for a communication system according to claim 16, characterized in that
 the step of processing to decode the protocol

messages has:

a step of processing to decode the receive
protocol message input via the interface library,
preparing a message tree showing a relationship of
5 a hierarchy of each node of the receive protocol
message based on the definition regulated in the
definition file, and outputting the message tree
to the memory managing section; and

a step of detecting data of an arbitrary node
10 denoted by a path designated from among the data
relating to the nodes of the receive protocol message
managed at the memory managing section based on a path
denoting a node at which there is desired data, which
is designated via the interface library.

15 18. A simulation method for a communication
system according to claim 14, characterized by further
comprising:

a step of preparing a user interface to receive
an editing operation in each section of node of a
20 desired protocol message via the interface library;

a step of editing to encode and decode the desired
protocol message based on the editing operations
received at the user interface;

a step of carrying out a second display control
25 for causing to display onto the display section
contents of the editing operation in each section of
node of the desired protocol message received by the

user interface in the step of editing to encode and decode; and

5 a step of preparing a descriptive format scenario storage section which stores a descriptive format scenario in which a sequence for transmitting and receiving the desired protocol message edited in the step of editing to encode and decode has been described.

10 19. A simulation method for a communication system according to claim 18, characterized in that the step of processing to decode the protocol messages has:

15 a step of processing to decode the desired protocol message, preparing a message tree showing a relationship of a hierarchy of each node of the desired protocol message based on the definition regulated in the definition file, and causing to display the message tree onto the display section via the step of carrying out a second display control;

20 a step of outputting the message tree to the memory managing section; and

25 a step of detecting data of an arbitrary node denoted by a path designated from among the data relating to the nodes of the desired protocol message managed at the memory managing section based on a path denoting a node at which there is desired data, which is designated via the interface library.

20. A simulation method for a communication system according to claim 16, characterized in that the step of executing a scenario has:

5 a step of preparing an executable format scenario storage section which translates a descriptive format scenario in which a sequence for executing transmission in a desired protocol message to the communication terminal to be evaluated and reception in the desired protocol message from the communication terminal to be
10 evaluated has been described, into an executable format scenario, and which stores a translated scenario, and
a step of executing the sequence for transmitting and receiving in the desired protocol message with respect to the communication terminal to be evaluated
15 based on the executable format scenario stored in the executable format scenario storage section.

21. A simulation method for a communication system according to claim 17, characterized in that the step of executing a scenario has:

20 a step of acquiring the reception path denoting a desired node from the message tree of the desired receive protocol message which has been prepared by the step of processing to decode, and which relates to reception from the communication terminal to be
25 evaluated;

a step of acquiring a value of data of an arbitrary node denoted by the reception path designated

from among the data relating to the nodes of the receive protocol message managed at the memory managing section denotes based on the reception path acquired by the step of acquiring the reception path;

5 a step of reading an expected value which has been stored in the executable format scenario executing storage section or the memory managing section in advance, and which becomes an origin to be contrasted for determination; and

10 a step of comparatively determining an acquired value of the data of the node and a read expected value.

22. A simulation method for a communication system according to claim 21, characterized in that

15 the step of carrying out a first display control has:

 a step of causing to display the value of the data of the node acquired by the step of executing the scenario and the expected value read by the step of executing the scenario so as to correspond to each other onto the display section; and

20

 a step of causing to display a comparatively determined result by the step of executing the scenario so as to be identified as being normal or abnormal.

25 23. A simulation method for a communication system according to claim 19, characterized in that the step of editing to encode and decode has:

a step of acquiring the reception path denoting a desired node from the message tree of the desired receive protocol message which has been prepared in advance by the step of processing to decode, and which
5 relates to reception from the communication terminal to be evaluated;

a step of acquiring a value of data of a node of the desired receive protocol message selected based on the reception path acquired by the step of acquiring
10 the reception path;

a step of acquiring a transmission path denoting a node corresponding to the selected node of the desired receive protocol message from a message tree of a desired transmit protocol message which has
15 been prepared in advance by the step of processing to decode, and which relates to transmission to the communication terminal to be evaluated; and

a step of inserting a value of data of the selected node of the desired receive protocol message as a value of data of the node of the desired receive
20 protocol message selected based on the transmission path acquired by the step of acquiring the transmission path.

24. A simulation method for a communication
25 system according to claim 17, characterized in that

the step of processing to decode has:

a step of selecting a desired first node from

an evaluation message tree prepared from evaluation protocol messages to be evaluated; and

5 a step of detecting a second node which is a path same as the path of the desired first node selected from the evaluation message tree, from a reference message tree prepared from reference protocol messages for being compared with the evaluation protocol messages to be evaluated, and

10 the step of carrying out a first display control has:

a step of causing to display the first node selected from the evaluation message tree and a reference message tree including the second node selected from the reference message tree so as to
15 be compared onto the display section.

25. A simulation method for a communication system according to claim 22, characterized in that
in accordance with an opening/closing operation for a child tree from one message tree of the evaluation message tree and the reference message tree,
20 opening/closing of another child tree which is same as the child tree is carried out.

26. A simulation method for a communication system according to claim 22, characterized in that
25 the evaluation protocol message is a receive protocol message which becomes an object to be evaluated from the communication terminal to be

evaluated, and the reference protocol message is a receive protocol message for reference in communication by a terminal of a same type as that of the communication terminal to be evaluated.